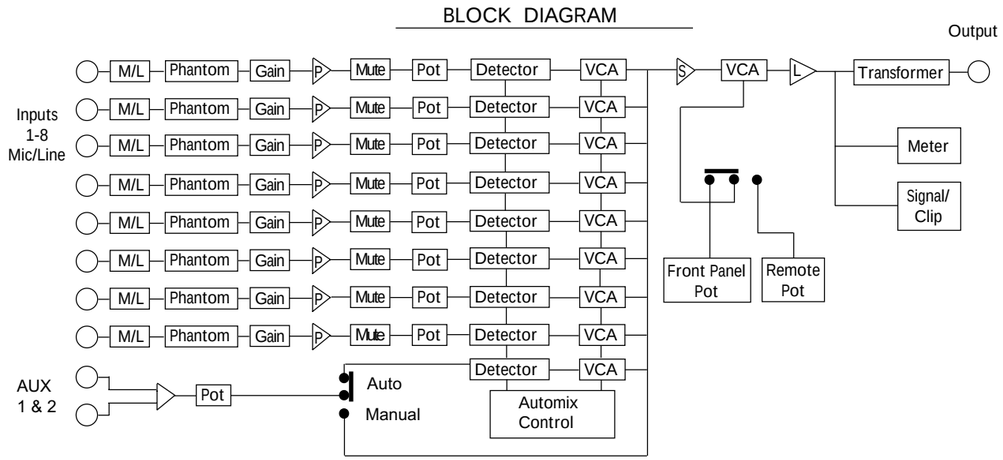
MODEL 2012 AUTOMIXER



ARCHITECT'S & ENGINEER'S SPECIFICATION

The automatic mixer shall use the Dugan Speech System of automatic mixing.

The automatic mixer shall be constructed in a 1RU chassis, with complete electronics section removable from the front of the chassis, without the need to remove wiring. The unit shall be designed to mount in a standard 19" EIA rack. The auto-mixer shall have a UL approved power supply.

Each automixer chassis shall accept up to 8 balanced microphone or line level signals and 2 unbalanced line level inputs. The mic/line inputs shall be switchable between microhone or line level operation, and gain setting jumpers to allow adjustment of input gain structure.

The automixer shall have a visual indicator for signal presence and clipping, that monitors all inputs. The automixer shall also have a 12 segment LED bar meter to indicate output level.

The automixer shall have provision for assigning mic/line inputs to a group mute bus, via a DIP switch. A closure to ground shall activate the group mute function.

The master output shall be transformer isolated. The master output level shall be controllable via a front panel potentiometer, or a remotely mounted potentiometer.

The automatic mixer shall be:

Protech Audio Corp. Model 2012

SPECIFICATIONS, MODEL 2012

INPUT SECTION

Input Gain Microphone	30-50dB, switch selectable, plus front panel variable mix gain control
Input Gain Line	0-20dB, Adjustable
AUX Input	0- 15dB
Mute Attenuation	70dB, Min.
Maximum Input Level	-10dBvVMic, +20dBv Line
Input Impedance	1K Ohms Nominal Mic, 15K Ohms Line
Group Mute Control	DIP Switch Connection To Buss
Phantom Power	15VDC
Remote Control Range	+12dB, To -75dB

OUTPUT SECTION

Master/Slave Operation	Slide Switch Controlled
Distortion + N	0.07% Maximum
Noise	-123dBV (150 Ohm Source)
Frequency Response	30Hz To 20KHz, ±0.1dB
Operating Temperature	0 To +70 Degrees C
Power Requirement	0.5 Amps/120VAC
Dimensions	1.75"H x 19"W x 10.5"D
Shipping Weight	Approx. 8 Lbs.

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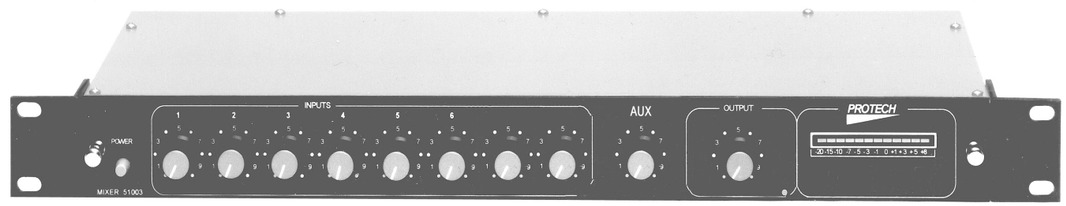
DUGAN Automixer

Model 2012



Features

- Automatic mixing with Dugan Speech System
- 8 Mic/Line inputs with selectable gain structures
- 2 AUX inputs with manual and auto mode
- Phantom power switchable on each mic input
- Clip indicator for all inputs
- Assignable group mute on mic/line inputs
- 12 segment LED metering of output level
- Remote gain control capability on master output
- U.S. Patent 3,992,584

Applications

School Board Meetings
Council Chambers
Courtrooms
Corporate presentation
Houses of Worship
Board Rooms
Legislative Chambers
Meeting Rooms

The Protech Audio Model 2012 Automatic Mixer is designed specifically for small venues and rental service. The unit is designed around the patented Dugan Speech System.

Much like an experienced console operator, the Dugan algorithm allows turning up the gain on an active channel, while simultaneously attenuating unused channels. By subtracting additional gain from unused channels, the unit reduces echo and redistributes that gain to active channels. This allows greater gain-before-feedback than gated mixers.

The Model 2012 adds 2 AUX inputs that are summed to a common signal that is adjustable via a front panel control. The AUX inputs can be switched between automatic and manual mode operation.

Engineers at Protech Audio have worked directly with Dan Dugan to develop circuitry that accomplishes his algorithm economically and accurately, bringing transparent automixing to smaller installations.

For larger installations, Protech Audio manufactures the Models 2004, 2008, 2000 and 2000-C Automixers.

www.protechaudio.com

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Dugan Operation

How does an accurate implementation of the Dugan Speech system algorithm result in superior audio performance?

First, the algorithm provides more useable gain to active inputs. Unlike gating automixers, the Dugan Speech System subtracts gain from unused inputs, and makes that gain available to active inputs. Gating automixers leave that gain in the unused inputs, and therefore cannot achieve the same output level before feedback.

Trying to process coherent signals also creates problems for the gated automixers (see next page). A gated mixer does not recognize the difference between coherent and non-coherent signals. These artifacts are most noticeable in recorded proceedings, or teleconferencing applications.

Second, by subtracting gain from unused inputs, and moving it to active inputs, the amount of room echo is greatly reduced. A gated mixer would leave unused inputs at higher gain levels, and pick up more room noise. In using the Dugan automixers, the incoming teleconference signal is introduced into the local mix bus. This will turn down the gain on the microphones while the incoming signal is present and greatly reduce acoustic echo.

Perhaps the best way to describe the actual effect of the Dugan Speech System, would be to compare it to an audio professional sitting at a mix position. As an actor or entertainer walks across the stage, the person doing the mixing adjusts the faders on different inputs, to follow the action. At some point the actor will be standing directly in front of a single microphone, and the fader for that channel will be pushed to high gain, while the faders for all the other channel will be pulled down. As the actor walks across the stage, leaving one microphone position and approaching another, the mixer will pull down th fader for the one mic as he or she raises the fader for the new position. No abrupt gain changes, just smooth transitions from oneposition to the next. The Dugan Speech System does the same thing, automatically!

Model 2012

The mechanical architecture of the Model 2012 is an electronic works-in-a-drawer. This allows input circuits to be configured quickly, from the front of the unit.

The gain structure of each mic/line input has both a mic/line switch and a gain setting push-on jumper. When the mic/line switch is placed into the LINE position, it places a resistive pad into the input circuit, and automatically disconnects the phantom power. Each input circuit has a push-on jumper to select phantom power. The phantom power voltage is 15VDC. Both the mic/line switch and the gain setting push-on jumper are placed ahead of the front panel level control, on each input. The front panel level control adjusts the mix level.

The gain setting push-on jumper adjusts the gain for either 30dB or 50dB, in the MIC position, and 0dB or 20dB, when placed into the LINE position. This allows the gain structure to be tailored to the exact application, and optimizes the signal-to-noise ratio. The Model 2008 is shipped from the factory with the gain setting jumper in the 50dB/20dB position.

Each mic/line input is assignable to a mute bus, via an 8 position DIP switch. If necessary all 8 inputs can be assigned to the mute bus. Activation of the mute function is via a remote closure.

The AUX inputs are summed to a common signal and may be used in a manual or automatic mode.

The Model 2012 utilizes a unique clip indicator circuit. The circuit uses a bicolor LED that indicates both signal presence and clipping. When an input is about to be overloaded the LED changes from a green to a red color.

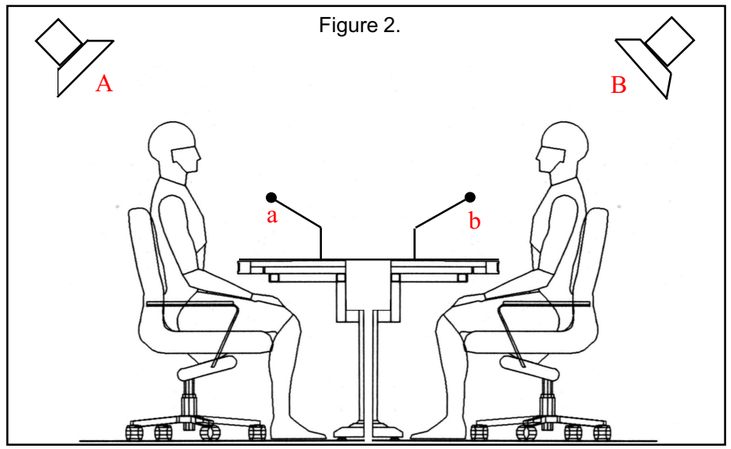
The master output of the Model 2012 is transformer isolated. Remote control capability of the output level is built in. A simple 10K ohm potentiometer, mounted in a remote location, will control the output level. Placing a resistor in series with the remote potentiometer will restrict the overall range of the

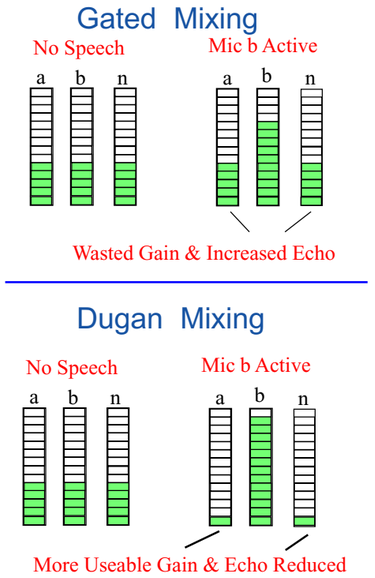
Doing the math.

The original Dugan algorithm works on an elegantly simple principle. *Each individual input channel is attenuated by an amount, equal to the difference in dB, between that channel's level and the level of the sum of all channel before processing. It is a continuous computing function with no threshold and no gating.*

Dugan Vs. Gated Mixing

Figure 2.





Example 1- Gated Mixers.

The gain of unused microphone channels would remain at a fixed level, even though another microphone channel is in use. This results in more background noise pickup, or room echo effect from speakers A & B. It also limits the maximum gain available for the active channel, and a lower signal-to-noise ratio.

Example 2 - Dugan Mixing

In Figure 2, microphone "a" would be attenuated, while microphone "b" is in use. This will reduce the level of unwanted signals entering microphone "a". This feature would be effective for all other microphones in the system. The effect is to greatly reduce room echo. Another benefit of the Dugan mixing is the gain reduction in the unused channels makes more gain available in the active channel, resulting in a higher SPL for that signal, and a better signal-to-noise ratio.

COHERENT AND NON-COHERENT SIGNALS

In a boardroom, different talkers use different microphones, and the signals entering these two microphones are totally unrelated to each other. These signals, which bear no relation to each other are called "non-coherent" signals.

A single talker, positioned an equal distance from two microphones, produces an equal signal in both microphones. Signals of this type are called "coherent" signals. Coherent signals do not have to be equal in level, but do have to be very similar. Another example of coherent signals reaching two or more microphones results when a door is slammed or a book is dropped at an approximately equal distance from two or more microphones.

The significance of coherent and non-coherent signals is this: When two non-coherent signals of equal level are mixed together, the resultant signal is 3dB higher than either of the two original signals. When two coherent signals of equal level are mixed together, the resultant signal is **6dB** higher than either of the two original signals.

If the design of an automatic mixer were to fail to recognize that coherent signals add differently than non-coherent signals, the automatic mixer could potentially make serious mixing errors. It would even be possible for the poorly designed automatic mixer to cause the sound system to go into feedback, or create increased acoustic echo amplification. The Dugan Speech System correctly senses the presence of coherent signals.